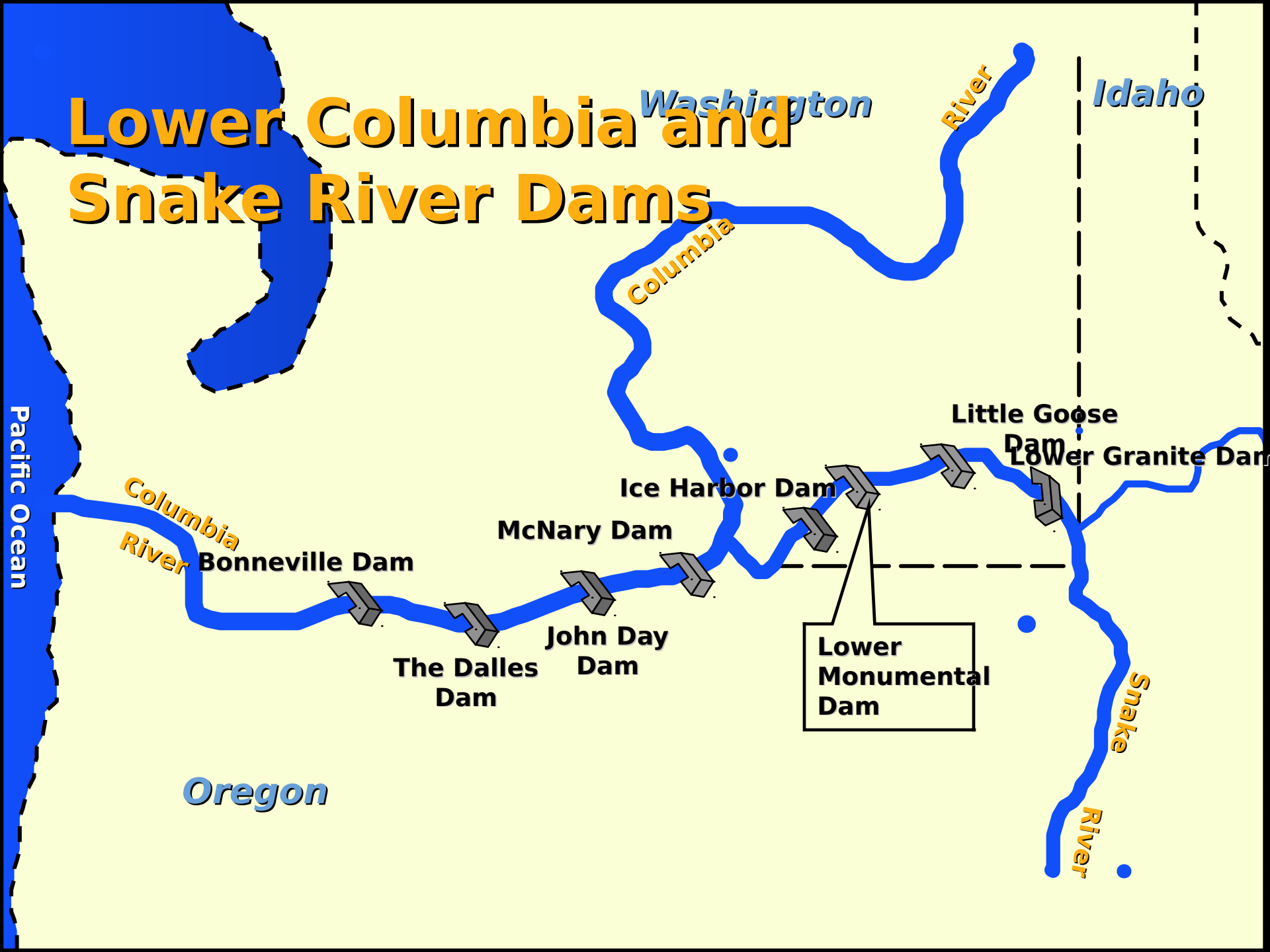


LOWER MONUMENTAL LOCK REHABILITATION



Lower Columbia and Snake River Dams



LOWER MONUMENTAL LOCK REHABILITATION



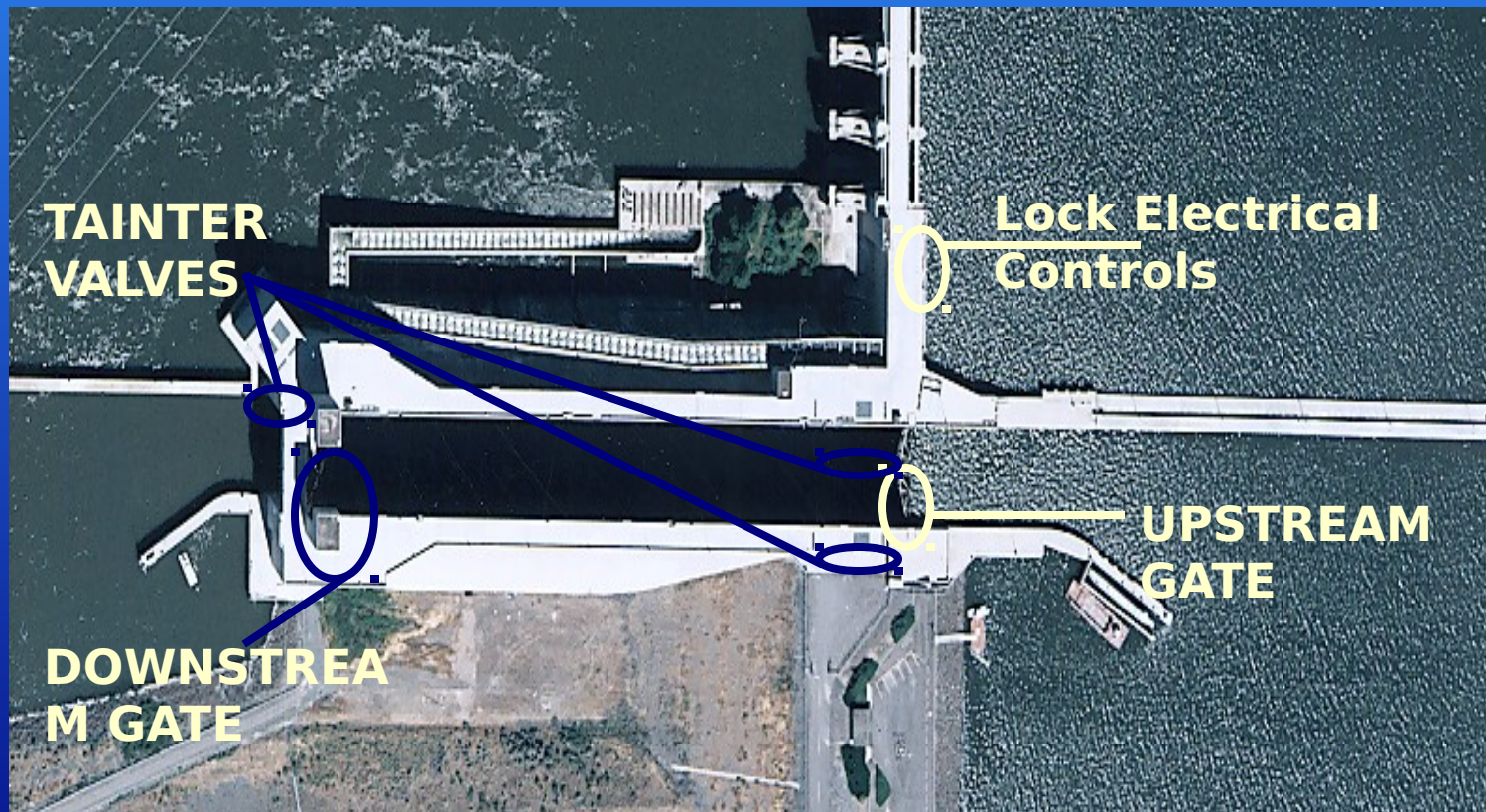
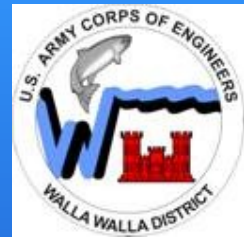
History

**Early 1990 - Fatigue Failures on
Navigation
Gates**

**1995/1996 - Emergency Replacement of
Downstream Lift Gate at
Ice Harbor**

**2005 - Current criteria for major
maintenance is capped at
10 million**

LOWER MONUMENTAL LOCK REHABILITATION



**Navigation
Lock**

DOWNSTREAM GATE



- **Submerged tied arch lift gate**
- **84 feet tall and 87 feet wide**
- **31 ribs with truss system**
- **Total lift height is approx. 100 feet**



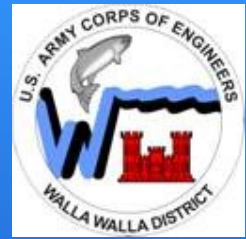
DOWNSTREAM GATE



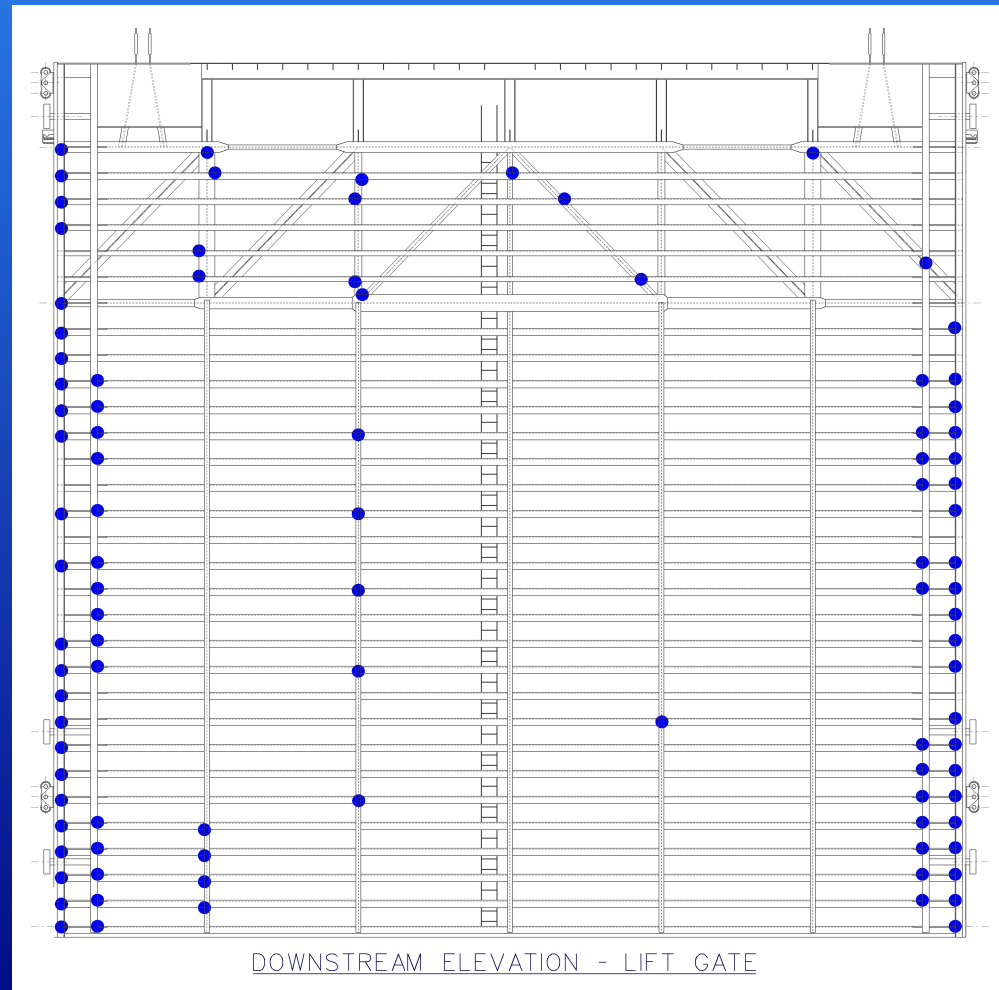
History

- **Approximately 50,000 lock cycles to date**
- **Extensive fatigue cracking and corrosion**
- **Continued cracking even after repair was performed**

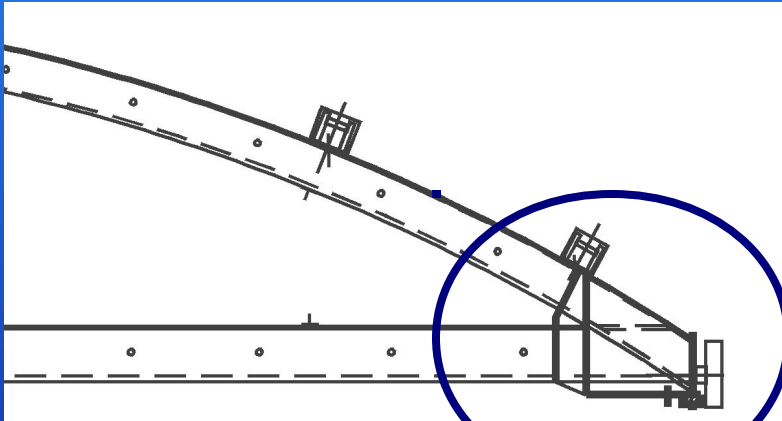
DOWNSTREAM GATE



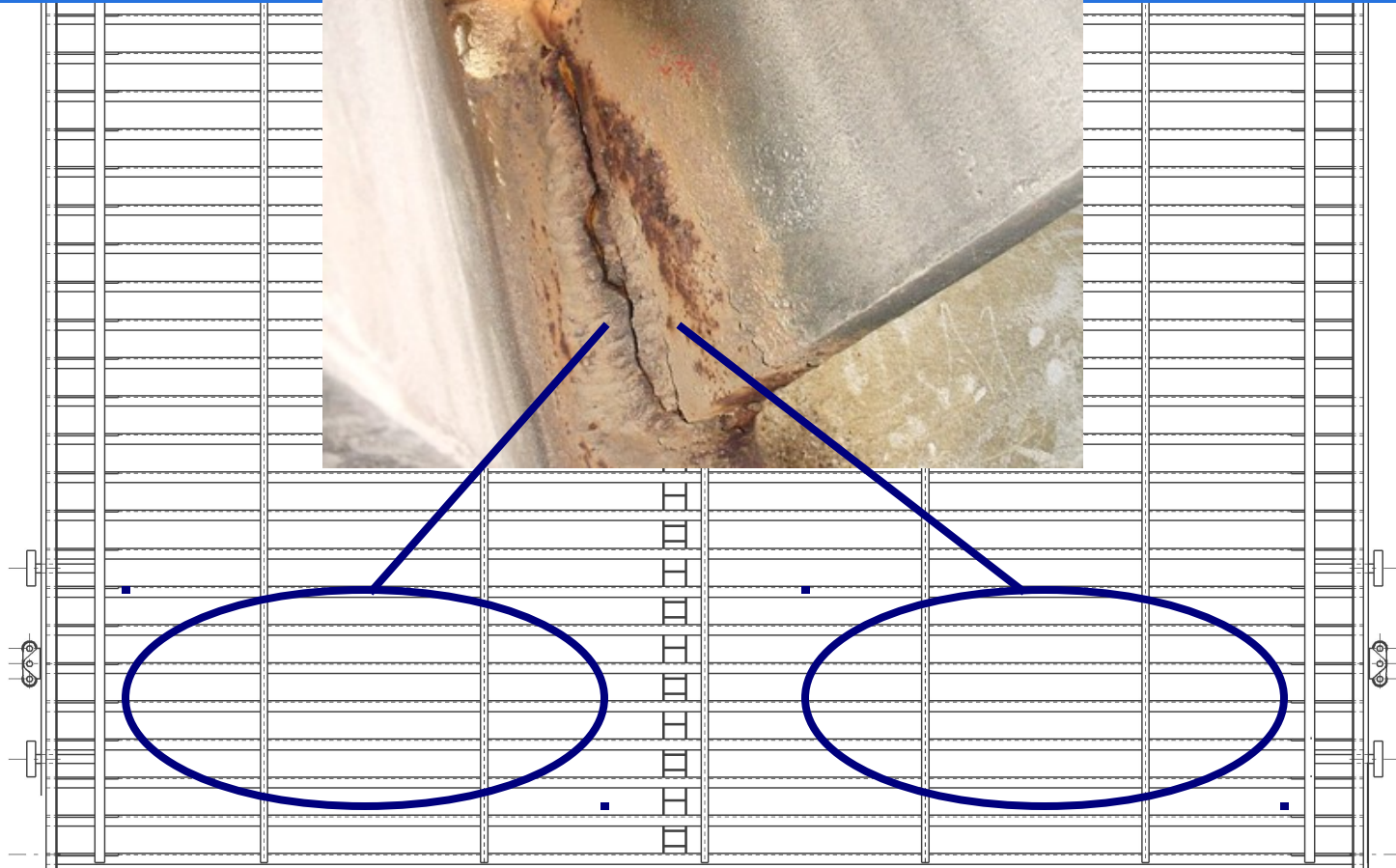
Cracks/Fractures



DOWNSTREAM GATE



DOWNSTREAM GATE

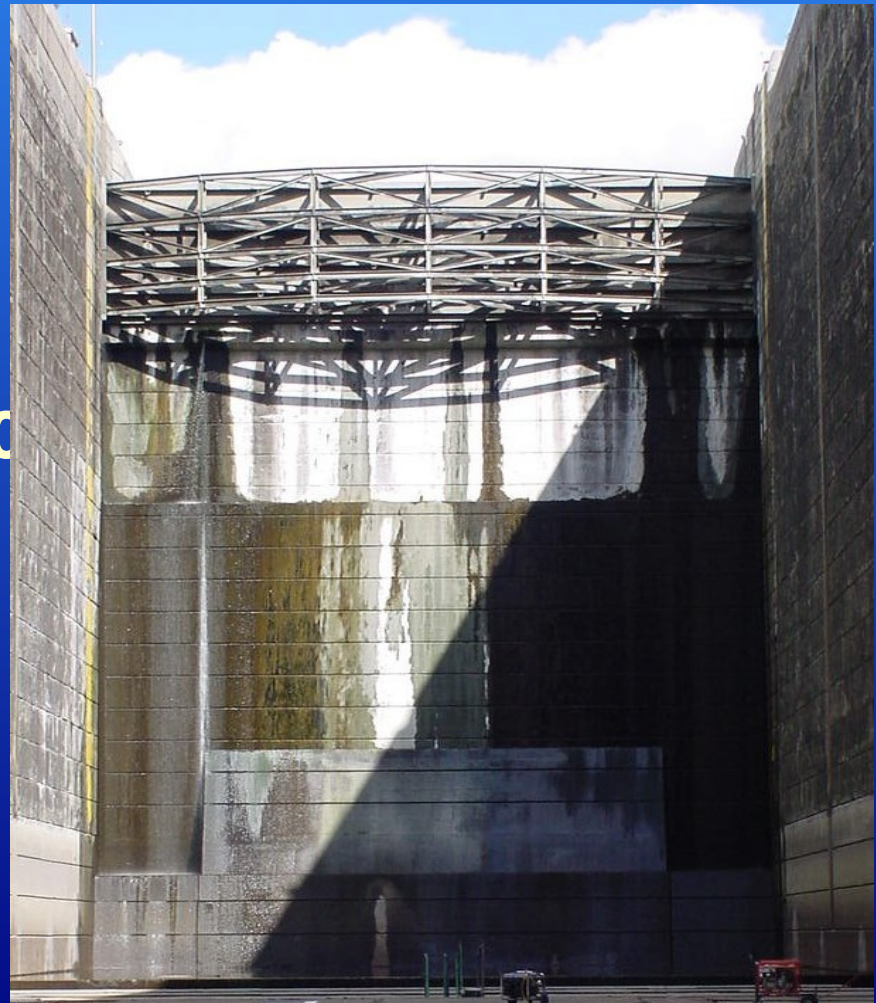


DOWNSTREAM ELEVATION - LIFT GATE

UPSTREAM GATE



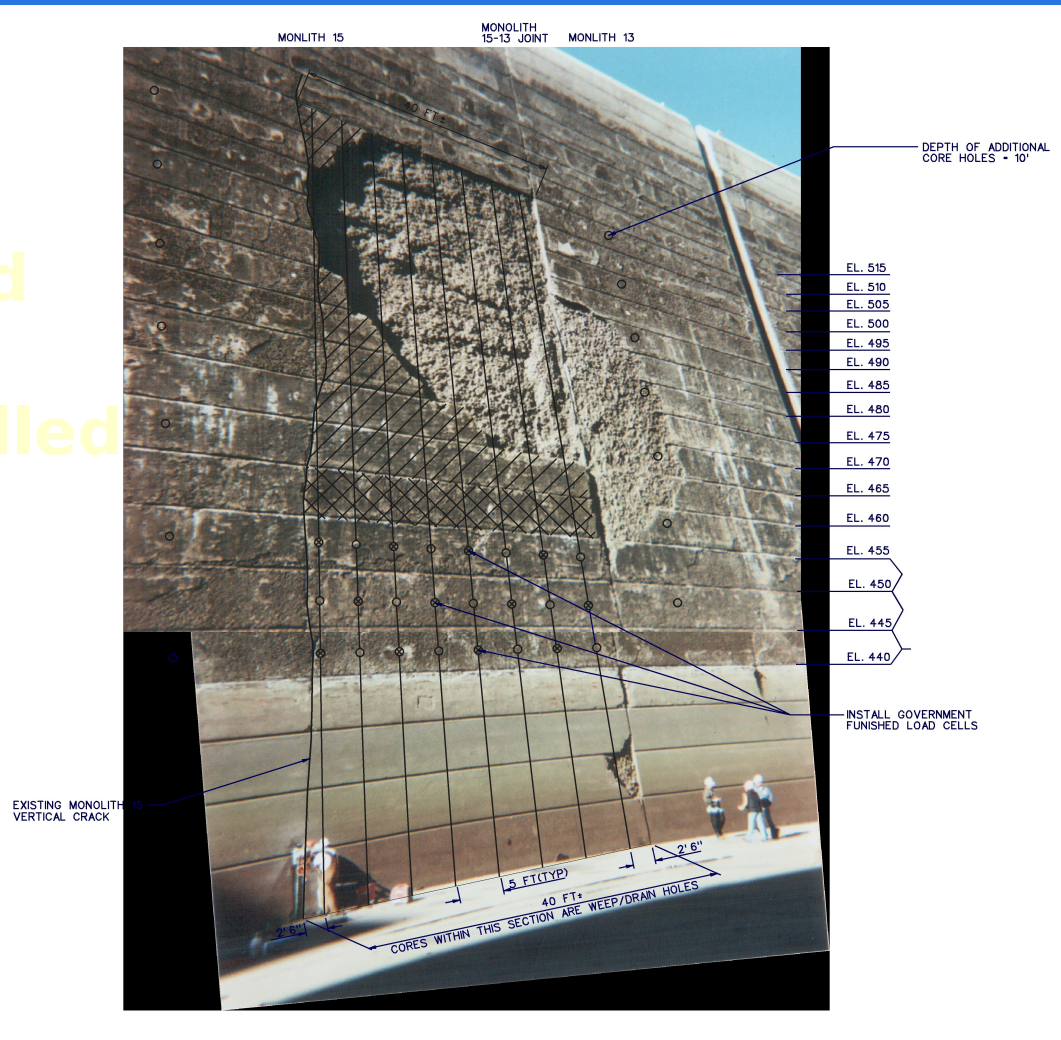
- Submersible lift gate
- 21.5 feet tall and 90 feet wide
- Vertical and horizontal trusses



CONCRETE STABILIZATION



- Over 100 tons of concrete removed
- 24 anchors installed
- Over 600 feet of concrete being analyzed



LOWER MONUMENTAL LOCK REHABILITATION



Justification for Rehabilitation

- **Consequences of not repairing downstream gate are severe**
- **Loss of structural integrity**
- **Risk of unplanned outages grows**
- **Cracks extend to other locations that
are difficult or impossible to
repair**

LOWER MONUMENTAL LOCK REHABILITATION



Conclusions

- ❖ **Cost of the rehabilitation is between 20 and 30 million – Major Rehab**
- ❖ **Investigation of concrete is ongoing and is set for completion early in 2006**
- ❖ **Schedule for proposed outage for construction ideally is early 2009**

LOWER MONUMENTAL LOCK REHABILITATION



Major Rehab

- ❖ **Reliability or Efficiency Improvements**
- ❖ **Minimum construction cost
2004 around \$10.5 million**
- ❖ **Does not include routine
maintenance**
Two construction seasons
- ❖ **Construction %50 cost shared with
Inland Waterways Users Trust Fund**

LOWER MONUMENTAL LOCK REHABILITATION



Starting the Rehab Study

Guidance – EP 1130-2-500, EC 11-2-166

Find the experts

Model Certification

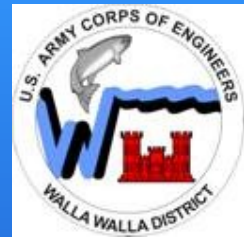
LOWER MONUMENTAL LOCK REHABILITATION



Institute of Water Resources - Major Rehab
Workshop

IWR - Navigation Risk model - LCLM

LOWER MONUMENTAL LOCK REHABILITATION



Navigation Risk

File

Tow Distribution

Name:

Description:

Percentage:

Length:

Main Cuts:

Auxiliary Cuts:

Delay Cost (\$/hr):

Reversion Threshold:

Diversion Cost:

Delay Threshold:

Delay Threshold Cost:

Diversion Cost (Planned Outage):

Record: of 2

Version 0.25 11/5/2003 - C:\NavRisk\LoMo_20050112.mdb

NUM

Microsoft

Start

Navigation...

C:\LockSt...

Microsoft E...

Microsoft P...

9:22 PM

LOWER MONUMENTAL LOCK REHABILITATION



Economic Data

Traffic

Commodities

Type of Vessels, Frequency, Operation Cost

Transportation Cost Savings

Alternative Cost Threshold

Unplanned Outage Duration and Economic Effect

LOWER MONUMENTAL LOCK REHABILITATION



Engineering Data

Event Tree for Each Component

Probability of Unsatisfactory Performance

Cost of Replacement

Duration for Planned and Unplanned Outage

LOWER MONUMENTAL LOCK REHABILITATION



Run – De-bug, Re-Run

Do results make sense

How many outages are predicted, what component, when?

Work with Independent Technical Review team early and often.